assigning a single variable length code to joint x and y differential motion vector components, wherein the single variable length code is assigned from a variable length code table, the table comprising a list of pairs of joint differential motion vector components and a corresponding variable length code for each pair, such that shorter variable length codes are assigned to joint differential motion vector components that have a higher probability of occurrence in the video images, and longer variable length codes are assigned to joint differential motion vector components that have a lower probability of occurrence, wherein the table includes the most probable pairs of joint differential motion vector components as computed by statistical analysis of example video sequences.

A2 Cont

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3. (Amended) The method of claim [2] 1 wherein the assigning [step] includes:

looking up the joint differential motion vector components in the table;

when no match is found in the table, coding an escape code along with a fixed length code for each differential motion vector component.

A2 Cont

Sub B2

4. (Amended) The method of claim 1 wherein the block of pixels corresponds to a macroblock in a video frame divided into fixed-sized, rectangular macroblocks, and the predicting computing, and assigning [steps] are repeated for the macroblocks in the video frame.

Sub B3

5. (Amended) The method of claim 1 wherein the block of pixels corresponds to a macroblock of a video object plane in video frame having two more video object planes, and the video object planes are each divided into fixed-sized, rectangular macroblocks; and

the predicting, computing and assigning [steps] are repeated for the macroblocks in the video object planes.

5
6. (Amended) A computer readable medium having instructions for performing the [steps] method of claim 1.

6
7. (Amended) In a video decoder, a method for decoding macroblocks of a predicted video frame comprising:

A2 cont'd receiving a single variable length code representing joint x and y components of a motion vector for each of the macroblocks;

for each of the macroblocks, searching for a single entry in an entropy codebook corresponding to the variable length code and including the x and y components of the motion vector, wherein training determines which x and y components to include in the entropy codebook; and

using the x and y components of the motion vector from the codebook to define motion of pixels in a corresponding macroblock.

9
10. (Amended) A computer readable medium having instructions for performing the [steps] method of claim 6.

A3 cont'd
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11. (Amended) A motion vector encoder comprising:

a motion vector predictor for computing a motion vector predictor for a motion vector of a block of pixels from at least one motion vector for a neighboring block of pixels;

a subtractor for computing differential motion vector components from motion vector components of the predictor and the motion vector of the block of pixels; and

a joint entropy coder for jointly coding the differential motion vector components with a single variable length code, wherein statistical analysis indicates which differential motion vector components to represent with variable length codes and which differential motion vector components to represent with an escape code followed by fixed length codes.

A3 concl

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~~13~~. (Amended) A motion vector decoder comprising:

a motion vector predictor for computing a motion vector predictor for a motion vector of a block of pixels from at least one motion vector for a neighboring block of pixels;

a joint entropy decoder for decoding a single variable length code into joint differential motion vector components, wherein the joint entropy decoder decodes the single variable length code by searching for the code in a Huffman coding table comprising a list of variable length codes and corresponding joint differential motion vector components for each of the variable length codes, wherein training determines which joint differential motion vector components to include in the table and which joint differential motion vector components to exclude from the table; and

A4 Concl

an adder for reconstructing X and Y motion vector components from the joint differential motion vector components and X and Y components of the motion vector predictor.

14

~~16~~. (Amended) In a video coder for coding video images in a block format, a method for improving compression of the video images comprising:

A5 coat

computing x and y motion vector components for a block;

forming the x and y motion vector components into a joint parameter representing joint x and y motion vector components; and

assigning a single variable length code to the joint x and y motion vector components, the single variable length code selected from a set of available variable length codes, such that shorter variable length codes are assigned to joint motion vector components that have a higher probability of occurrence in the video images, and longer variable length codes are assigned to joint differential motion vector components that have a lower probability of occurrence, wherein training determines which joint x and y motion vector components to represent in the set of available variable length codes.

17. (Amended) In a video decoder, a method for decoding macroblocks of a predicted video frame comprising:

receiving a single variable length code representing joint differential x and y components of a motion vector for each of the macroblocks;

for each of the macroblocks, searching for a single entry in a Huffman table corresponding to the variable length code and including the joint differential x and y components of the motion vector, wherein the Huffman table includes variable length codes for the most probable joint differential x and y components as computed by statistical analysis of example video sequences;

computing x and y components of a predictor motion vector from neighboring macroblocks to the macroblock currently being decoded; and

reconstructing the motion vector from the differential components obtained from the Huffman table and the x and y components of the predictor motion vector.

Respectfully submitted,

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